# Decadal Sea Level Variability over the Indian Ocean

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Previous studies (e.g. Lee and McPhaden 2008; Cai et al, 2005; Cheng et al, 2008) have noticed decadal changes in sea level in the Indian Ocean with opposite signs for the west coast of Australia (WA), and central Indian Ocean basin between 8°S and 18°S (CIOS). The consistency of sea level trends over the north Indian ocean, to the global estimates has been verified (Unnikrishnan and Sankar, 2007). As a concluding comment, Cheng et al (2008) clearly stated the need of further study on the causes of observed sea level rise in the Indian ocean warm pool region, since the computed steric sea level has little contribution to the observed sea level change during 1993-2005.

In this paper we are describing the long term sea-level trends in the Indian ocean using altimetry (1993-2009 period) and model results (1960-2006 period). The sea level and steric level trends over the whole Indian ocean basin for the period 1993-2004 is found to be 2.14 and 2.01 mm/year respectively. The model steric level exhibits strongest trends with consistent sign and locations (WA and CIOS) to those found in the observed sea level over the common period. The upper layer warming and freshening in different regions has been examined by considering thermosteric and halosteric components separately. In all regions, the time evolution of both sea level and steric level shows opposite patterns during 1993-2000 and 2000-2004. The model is further used to investigate in details the mechanisms of the sea level trend over the 1960-2004 period, and to isolate the respective influence of local forcing (Ekman pumping, heat and freshwater fluxes) and of the oceanic bridge of the Indonesian throughflow.

Keywords: Sea level; Steric level; decadal variability; Indonesian throughflow; warm pool

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